What kinds of materials?

	Typical Samples	Information obtained by SAXS	Practical Use
Polymers	■ Bulk polymers ■ Semi-crystalline polymers ■ Block copolymers ■ Polymer solutions ■ Synthetic polymers (e.g. plastic)	■ Lateral and bulk order ■ Periodicities ■ Molecular mass ■ Structure and shape	■ Characterize the morphological effects of drawing, rolling, and annealing on mechanical properties of polymers ■ Examine the ability of polymers to act as hosts for low-molar mass organic guest molecules (Nanocontainer)

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Biological Materials	■ Proteins, DNA, or RNA ■ Biological membranes ■ Biological solid structures and tissues	■ Shape ■ Structural arrangement ■ State of aggregation ■ Thickness and perfection of wrapping	■ Determine the collagen orientation and the structural organization of the collagen-mineral composite ■ Resolve the structure of huge protein/RNA/DNA complexes in their native environment e.g. in solution

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	Typical Samples	Information obtained by SAXS	Practical Use
Fibres	■ Polymeric fibres ■ Composites ■ Natural or artificial fibres	■ 3-D structure ■ Orientation ■ Orientation distribution ■ Internal structure of fibres	■ Improve mechanical, optical, thermal and electrical properties ■ Derive the structural models for the internal organization of fibre samples

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Colloids	■ Gels, sols ■ Aggregation processes ■ Templating nanomaterials	■ Size (distribution) and shape ■ Inter-particle interactions ■ Geletation/ aggregation state	■ Examine the sol to gel phase transition ■ Study the behavior of micellar aggregation ■ Observe the formation of colloids

What kinds of materials?

	Typical Samples	Information obtained by SAXS	Practical Use
Liquid Crystals	■ Piezoelectric materials ■ Colloidal suspensions ■ Displays for electronic devices	■ Size (distribution) and shape ■ Inter-particle interactions ■ Degree of crystallinity ■ Phase transitions	■ Optimizing electro optical devices and liquid crystal membranes ■ Controlling the quality for stabilized matrixes with fixed optical active molecules

What kinds of specimens?

Just about any kind of specimen works

transmission - has to be x-ray transparent

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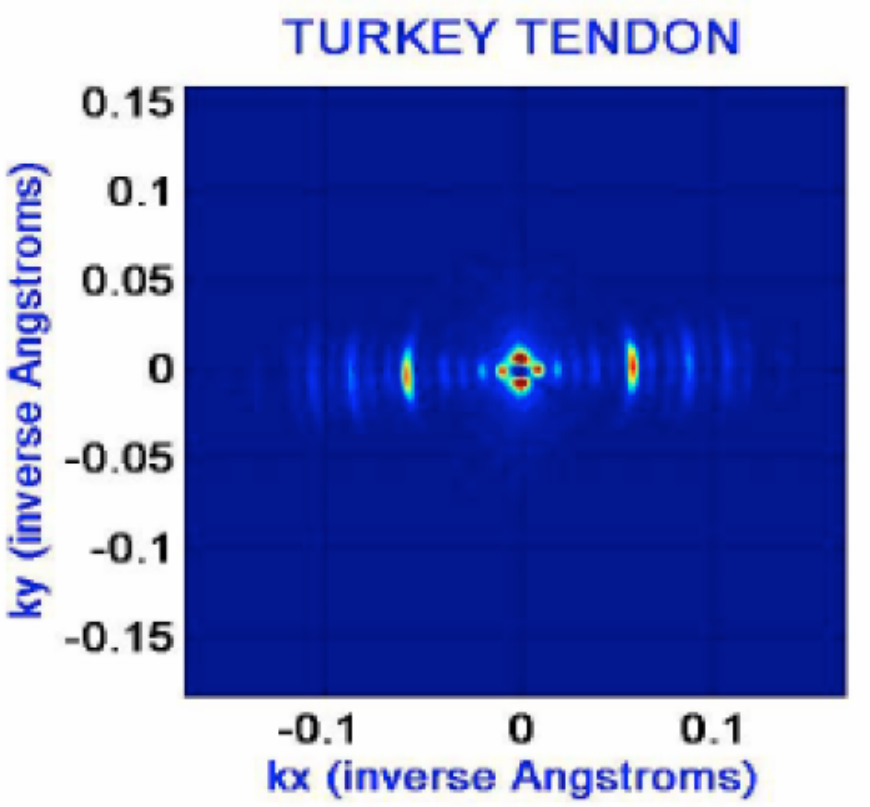

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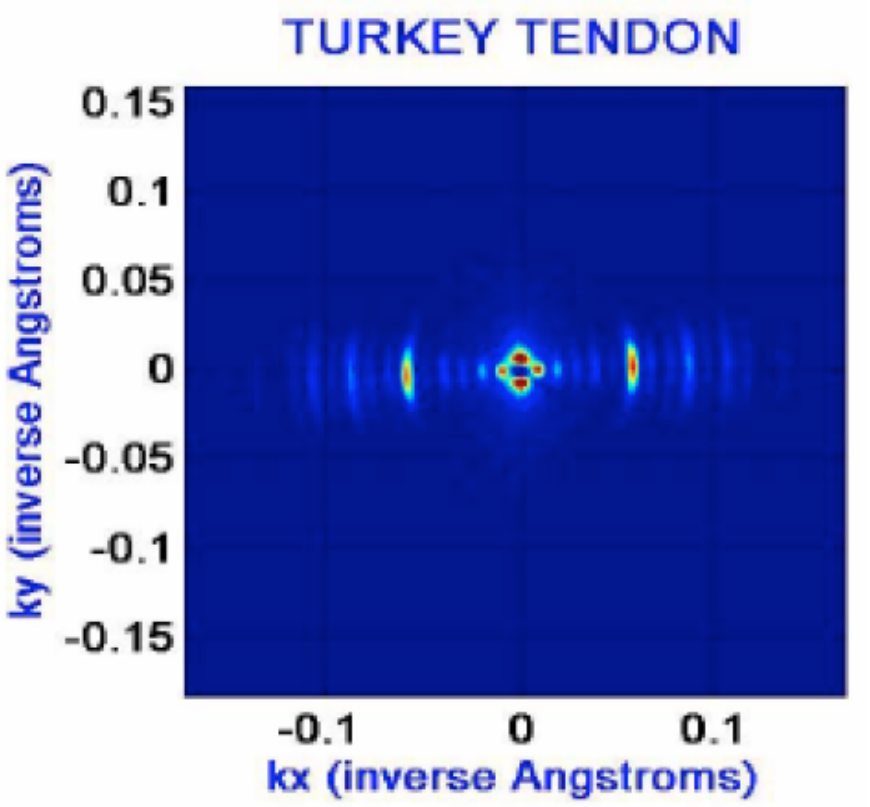

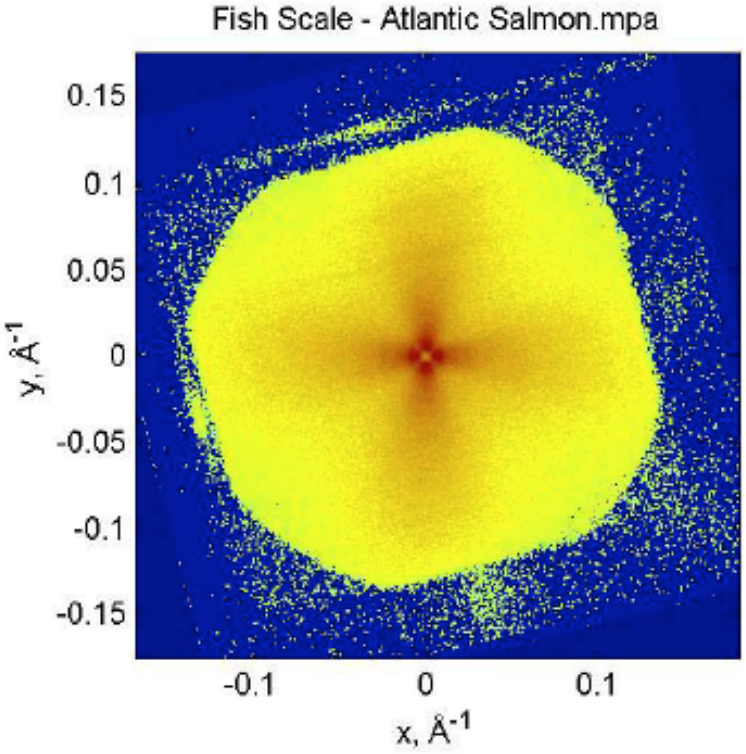

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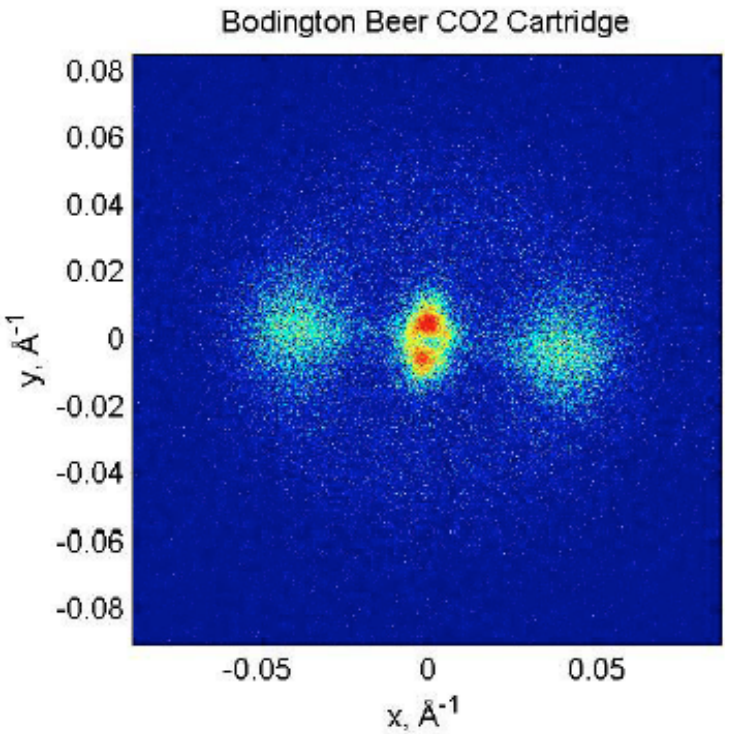

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Examples from literature

Polymer dendrimers

dilute solns in Ch_3OH to get dendrite sizes

dilute enuf so dendrimers don't correlate

Alkanediols

solns in water to study clustering

heavy water improves contrast (sans)

Water-based polymer latexes

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- solns in water to study clustering
  - heavy water improves contrast (sans)

Water-based polymer latexes
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Macromolecular foams
- wafers cut & immersed in toluene to get swelling
  - banded matls are translated *in situ*

Microemulsions
- oils in water to get droplet size

What kinds of specimens?

Examples from literature

CVD SiGe films

- μ-thin films stacked to get Ge heterogeneity

Nanotubes

- use surfactant in water & sonicate; place in quartz cells to study nanotube aggregation

Powders

- thin-walled capillaries

Polymers

- study crystallization processes *in situ* in hot cell

What kinds of specimens?

Examples from literature

Thin films on glass substrates

as is, but requires grazing incidence

Random crystalline block copolymers

rheology study *in situ* in rotating parallel disk cell to get crystal alignment and grain rotations

Splat-cooled glass

in situ annealing study to follow pptn of PbTe nano-crystals

What kinds of specimens?

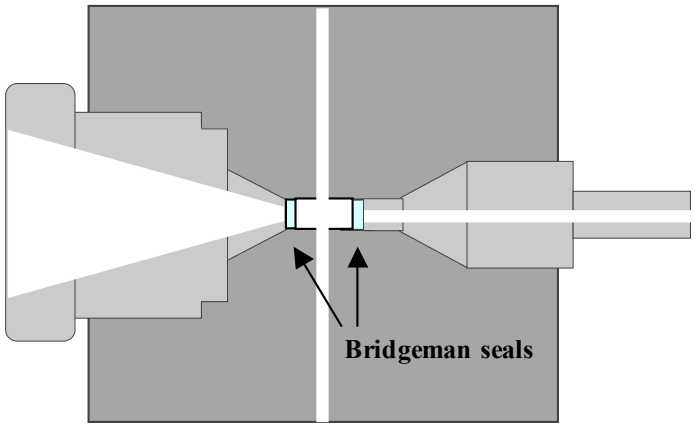
Examples from literature

Blown polymer films
special cell for *in situ* studies

Liq. Crystals
special magnetic cell for molecule rotation

Ionomers
cell w/ kapton windows

Hi pressure studies
diamond windows



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